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(54) LAMINATED FABRIC AND AIR BAG

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a laminated cloth having excellent adhesiveness between a resin and a woven fabric, no adhesion between woven fabrics by an additive and excellent weather resistance by a simple production method, to provide a method for producing the laminated cloth and to obtain an air bag.

SOLUTION: A polyurethane resin containing a polyester polyol containing ≥ 50 wt.% of an ester unit of a trimethyl-1,6-hexanediol and an aliphatic dicarboxylic acid and having 500-5,000 number-average molecular weight and a diisocyanate compound is laminated to at least one side of a filament woven fabric made of a synthetic resin to give the objective laminated fabric.

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CLAIMS

[Claim(s)]

[Claim 1] Trimethyl -Lamination cloth which comes to laminate the polyurethane resin with which the ester unit of 1 and 6-hexandiol and aliphatic series dicarboxylic acid is contained 50% of the weight or more, and number average molecular weight consists of the polyester polyol and the diisocyanate compound of 500-5,000 at least on one side of the filament textiles made of synthetic resin.

[Claim 2] The lamination cloth according to claim 1 whose aliphatic series dicarboxylic acid is an adipic acid.

[Claim 3] The lamination cloth according to claim 1 to 2 with which polyurethane resin contains a flame retarder.

[Claim 4] The lamination cloth according to claim 3 whose flame retarder is chlorinated polyolefins or a thiourea compound.

[Claim 5] The air bag for vehicles which consists of a lamination cloth of claims 1-4.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the air bag for vehicles which used the lamination cloth which coated the filament textile fabrics made of synthetic resin with the polyurethane resin which used aliphatic series polyester polyol for textile fabrics especially about the air bag which used the lamination cloth and it which come to coat specific polyurethane resin, its manufacture approach, and it.

[0002]

[Description of the Prior Art] In recent years, the air bag for crew's security in an automobile has spread quickly. In case of the collision of an automobile, a sensing pin center,large expands an air bag momentarily by this gas by generating an elevated temperature and high-pressure gas in response to the shock of a collision, and an air bag protects crew's face and head to a front collision, and protects a head, built-in, etc. to a side collision. An air bag uses the plain weave cloth of high intensity using the 400-1000-denier filament yarn made of synthetic resin, such as polyester, 6, and 6 nylon and 6 nylon, conventionally. An improvement to the inside, external surface, or both sides, such as thermal resistance, weatherability, fire retardancy, and air shutoff nature, sake, In chloroprene rubber, the Krol sulfonation polyolefine, and synthetic rubber and the elastomer like silicone rubber, by spreading and the base fabric which carried out the laminating, it is formed in saccate and lightweight and a thing foldable in a compact are demanded.

[0003] The air bag which formed the thin film of silicone rubber in textile fabrics is indicated by JP,2-270654,A. However, although silicone rubber was excellent in thermal resistance and weatherability, the lamination to textile fabrics was difficult, and mold grew in the obtained film and there was [**** / that there is a problem in respect of a life] a problem of being easy to generate a pinhole.

[0004] The air bag which laminated polyolefine system resin, such as ethylene propylene rubber, an ethylene-vinyl acetate copolymer, and ionomer resin, in textile fabrics is indicated by JP,4-97842,A. However, these resin was not enough as an adhesive property with textile fabrics, weatherability, or the expansibility of an air bag.

[0005] The polyurethane obtained from a polyol content vinyl chloride copolymer and isocyanate by textile fabrics is indicated by JP,4-143145,A. However, by these resin, since a vinyl chloride copolymer was contained, when the plasticizer is added and the air bag was saved in the state of receipt for a long period of time, there was a problem that a plasticizer loomed and base fabrics were sticky.

[0006]

[Problem(s) to be Solved by the Invention] The technical problem of this invention of the adhesive property of resin and textile fabrics is good, and is offering the air bag without adhesion between the textile fabrics by the additive which was excellent in weatherability and used the easy lamination cloth of the manufacture approach, its manufacture approach, and it.

[0007]

[Means for Solving the Problem] As a result of examining the various charges of a laminate material wholeheartedly in view of this trouble, by using the polyurethane which used specific polyester polyol for the charge of a laminate material, this invention persons were excellent in the expansibility of an

air bag, an adhesive property with textile fabrics, weatherability, and pinhole-proof nature, thickness by the additive which comes up and is not ** was thin, were lightweight, found out that a high intensity air bag was obtained easily, and completed this invention.

[0008] That is, this invention is trimethyl. -The ester unit of 1 and 6-hexandiol and aliphatic series dicarboxylic acid is contained 50% of the weight or more, and it is related with the lamination cloth which comes to laminate the polyurethane resin with which number average molecular weight consists of the polyester polyol and the diisocyanate compound of 500-5,000 at least on one side of the filament textiles made of synthetic resin. Moreover, this invention relates to the lamination cloth whose aliphatic series dicarboxylic acid is an adipic acid. Furthermore, this invention relates to the lamination cloth with which polyurethane resin contains a flame retarder. This invention relates to the air bag for vehicles which consists of the above-mentioned lamination cloth.

[0009]

[Embodiment of the Invention] The lamination cloth of this invention consists of polyurethane resin by which coating is carried out to one side or both sides of textile fabrics and textile fabrics. Even if the laminating is carried out to the shape of a field on textile fabrics, it sinks in between the filament yarn of textile fabrics, and coating of the polyurethane resin may be carried out. Introduction and textile fabrics are explained. As textile fabrics, gay polyester, such as polyethylene terephthalate, The copoly ester which copolymerized aliphatic series dicarboxylic acid, such as isophthalic acid, 5-sodium sulfoisophtharate, or an adipic acid, etc. for the acid component which constitutes the repeat unit of polyester, 6 and 6 nylon, 6 nylon, 12 nylon, 4, and 6 nylon and those nylon copolymers, The polyamide which copolymerized a polyalkylene glycol, dicarboxylic acid, amines, etc. to nylon, The aramid represented by copolymerization with PARAFENIRENTERE phthalamide and the aromatic series ether etc., A continuation monofilament or multifilament yarn, such as synthetic fibers, such as ape phon system resin, such as a PARAFENIRENSARU phon and Pori Sall John, and polyether ketone resin, a carbon fiber, and a glass fiber, can be used.

[0010] That whose size currently used conventionally is 400-1000 deniers as the above-mentioned filament yarn is used. The weave for obtaining textile fabrics from filament yarn is a plain weave, twill, etc. as textile fabrics -- the ground -- things, such as 50 - 250 g/m², and reinforcement of 150-1000kg / 3cm width of face, have desirable eyes.

[0011] Since coating of the above-mentioned textile fabrics is carried out with polyurethane resin, various additives may be included in filament yarn itself at the production process or the processing process. For example, a thermostabilizer, an antioxidant, light stabilizer, a lubricating agent, an antistatic agent, a plasticizer, a thickener, a pigment, a flame retarder, etc. can be made to contain. A flame retarder etc. can also be later infiltrated into textile fabrics.

[0012] Next, the polyurethane resin with which the above-mentioned textile fabrics are coated is explained. The polyurethane resin used for this invention contains the polyurethane resin which giant-molecule polyester polyol and a diisocyanate compound are made to react, and is obtained. The above-mentioned giant-molecule polyester polyol is 3, 3, and 5-trimethyl at least. -It is 1 and 6-hexandiol and/or 3 and 5, and 5-trimethyl. -It consists of 1 and 6-hexandiol (it is trimethyl about the following and these -it is called 1 and 6-hexandiol (TMHD)), and aliphatic series dicarboxylic acid, the whole contains an ester unit with TMHD(s) and aliphatic series dicarboxylic acid 50% of the weight or more, and an end is the thing of an alcoholic hydroxyl group. Therefore, as giant-molecule polyester polyol used by this invention, the mixture of (1) aliphatic-series dicarboxylic acid and the polyester polyol of TMHD, (2) aliphatic-series dicarboxylic acid and the polyester polyol of the mixture of the polyol of TMHD and others, (3) aliphatic-series dicarboxylic acid and the polyester polyol of other polyols or other polyester polyols, and the above (1) or the polyester polyol of (2) is mentioned.

[0013] As the above-mentioned polyester polyol, the macromolecule polyester polyol of 500-5000 has desirable number average molecular weight (especially by this invention, unless it refuses, molecular weight is shown with a number average). Since the solubility over a diluent falls with [molecular weight] 500 [less than], spreading nature is inferior, and in exceeding 5000, it becomes inadequate in respect of drying and blocking resistance.

[0014] As the above and other polyols, (1) ethylene oxide, propylene oxide, The polyether polyols it is incomparable from a polymer or copolymers, such as a tetrahydrofuran (2) A glycerol, trimethylol propane, trimethylolethane, 1, 2, 6-hexane triol, 1 and 2, 4-butane triol, Pentaerythritol, a sorbitol,

ethylene glycol, 1,3-propanediol, 1,3-butanediol, 1,4-butanediol, neopentyl glycol, Pentanediol, hexandiol, octanediol, 1, 4-butyndiol, The low-molecular glycols of saturation, such as a diethylene glycol, triethylene glycol, and dipropylene glycol, and partial saturation are mentioned. As polyester polyol besides the above (3) The polyester polyols obtained by carrying out ring opening polymerization of the cyclic-ester compound, (4) polycarbonate polyols, (5) polybutadiene glycols, and the glycols that added ethylene oxide or propylene oxide to bisphenol A, and were obtained are mentioned.

[0015] As aliphatic series dicarboxylic acid, the acid anhydride or acid chlorides corresponding to a dibasic acid or these, such as an adipic acid, phthalic anhydride, isophthalic acid, a terephthalic acid, a maleic acid, a fumaric acid, a succinic acid, oxalic acid, a colon acid, a glutaric acid, a pimelic acid, a suberic acid, an azelaic acid, and a sebacic acid, are mentioned.

[0016] The polyurethane resin of this invention may contain the low-molecular polyol other than macromolecule polyester polyol as a constituent. As low-molecular polyol, the aliphatic series dibasic acid ester of polytrimethyl hexandiol especially a horse mackerel peat, or said various kinds of low-molecular polyols that can be used for macromolecule polyol manufacture can be illustrated. As for the amount of the low-molecular polyol used, it is desirable that it is 10 or less % of the weight of macromolecule polyol. It is because the solubility over the adhesion over textile fabrics and the diluent of the coating coating obtained will fall if an operating rate exceeds 10 % of the weight.

[0017] The diisocyanate compound in this invention means the diisocyanate of aromatic series, aliphatic series, and an alicycle group. Specifically 1,5-naphthalene diisocyanate, 4, and 4'-diphenylmethane diisocyanate, - diphenylmethane diisocyanate, and 4 and 4' 4, 4'-dibenzyl isocyanate, Dialkyl diphenylmethane isocyanate, tetra-alkyl diphenylmethane diisocyanate, 1, 3-phenylene diisocyanate, 1, 4-phenylene diisocyanate, Tolylene diisocyanate, butane -1, 4-diisocyanate, hexamethylene di-isocyanate, 2, 2, 4-trimethyl hexamethylene di-isocyanate, 2 and 4, 4-trimethyl hexamethylene di-isocyanate, Tolidine di-isocyanate, a cyclohexane -1, 4-diisocyanate, Xylylene diisocyanate, isophorone diisocyanate, dicyclohexyl methane -4, 4'-diisocyanate, 1, a 3-bis (isocyanate methyl) cyclohexane, methylcyclohexane diisocyanate, etc. can be illustrated. In order to laminate the external surface of textile fabrics, the diisocyanate which an isocyanate radical like aliphatic series and an alicycle group combined with aliphatic hydrocarbon from standpoints, such as weatherability, is desirable.

[0018] In this invention, a chain expanding agent can also be used for polyurethane resin. As a chain expanding agent, ethylenediamine, propylenediamine, a hexamethylenediamine, diethylenetriamine, triethylenetetramine, isophorone diamine, dicyclohexyl methane -4, and 4'-diamine can be illustrated. Moreover, the diamines, for example, 2-hydroxyethyl ethylenediamine, which have a hydroxyl group, 2-hydroxyethyl propylenediamine, G 2-hydroxyethyl ethylenediamine, G 2-hydroxyethyl propylenediamine, 2-hydroxypropyl ethylenediamine, G 2-hydroxypropyl ethylenediamine, etc. can be similarly used for intramolecular.

[0019] When the polyurethane resin in this invention uses an amino-group content compound as a chain expanding agent, a terminator, or a stabilizer, it is desirable that the range of amine ** of the obtained polyurethane resin is 0-10 (KOHmg/g). The amino group contained if amine ** is in this range, and said trimethyl -It is because it has the adhesion lamination fitness which was excellent to textile fabrics according to the effectiveness of the soft segment of 1 and 6-hexandiol.

[0020] As for the polyurethane resin used by this invention, it is desirable that number average molecular weight (Mn) is within the limits of 5,000-100,000. When number average molecular weight is less than 5,000, drying [of a coating coating], blocking resistance, and coat reinforcement are inferior, in exceeding 100,000 on the other hand, viscosity becomes high too much and spreading nature worsens.

[0021] In this invention, a flame retarder can be added to polyurethane resin. As a flame retarder, a thiourea system compound, a halogen system organic compound especially chlorinated polyolefins, a phosphorus system organic compound, an inorganic flame retardant, etc. can be added. As chlorinated polyolefins, for example, the copolymer of monomers, such as an ethylene homopolymer, a propylene homopolymer, or this, and other olefin system monomers is chlorinated, and especially chlorine content has 10 - 40 desirable % of the weight one to 60% of the weight. Moreover, as for the number average molecular weight of this chlorination olefin, 5,000-200,000, especially 10,000-100,000 are

suitable. A solid regulation target does not ask. It is desirable that the additions of chlorinated polyolefins are polyurethane resin (1) / chlorinated-polyolefins (2) = 5 / 95 - 95/5 (% of the weight), and if it is this range, the compounding ratio of polyurethane resin (1) and chlorinated polyolefins (2) can be set as arbitration. Although polyurethane resin and chlorinated polyolefins originally have bad compatibility, since the polyurethane resin which consists of specific macromolecule polyol is used for the above-mentioned constituent used by this invention, they have the description it is featureless in a uniform and transparent solution.

[0022] The usual coating methods, such as the approach of coating with sticking by pressure or heating of an approach and a urethane resin film which applies the solution of the above-mentioned urethane resin, and is dried and coated as an approach of laminating above-mentioned urethane resin by spreading and the laminating, and the extrusion laminating method, and the dry laminate method using adhesives and hot melt adhesive when still more nearly required can be used.

[0023] usually independent [in ketones, such as alcohols solvent:acetones, such as ester solvent:methanols, such as aromatic solvents, such as benzene, toluene, and a xylene, ethyl acetate, and butyl acetate ethanol, isopropyl alcohol and n-butanol, a methyl ethyl ketone, and methyl isobutyl ketone,] as a solvent for the dissolution, when applying by using polyurethane resin as a solution -- or it can be mixed and used.

[0024] Although the film of polyurethane resin can also be obtained from a polyurethane solution, it can carry out heating fusion of the polyurethane resin itself obtained by the reaction of polyester polyol and isocyanate, and can use it as a film with an extrusion process.

[0025] the thickness of a lamination layer -- 1-100 micrometers -- desirable -- 5-30 micrometers -- it is -- the amount of coatings -- 10 - 200 g/m² -- it is 20 - 100 g/m² preferably. Coating of the lamination layer may be carried out all over the textile fabrics which constitute an air bag, and as long as the average porosity seen from the whole air bag surface is 2ml[/cm] 2/min, coating of it may be carried out partially. Since **** of urethane resin and tearing strength join the reinforcement of textile fabrics by laminating urethane resin, the mechanical strength of an air bag improves.

[0026]

[Example] Hereafter, although an example explains this invention concretely, this invention is not limited to these. In addition, especially "%", the case where it is shown is removed, and also "% of the weight" is shown, and a "ratio" shows a "weight ratio."

[0027] (The synthetic example 1: Composition of polyester polyol) 1,578.2 g and an adipic acid were 1,194.-9-g-taught to the 3l. flask furnished with a capacitor, dehydration tubing, a stirrer, a thermometer, and nitrogen gas installation tubing, 3, 3, and 5-trimethyl hexandiol and 3 and 5, and 5-trimethyl hexandiol (ratio 1:2.7) were heated in it, and it was made to react to it. Water began to distill from near 160 degree C, and the internal temperature raised reaction temperature to 180 degrees C over about 4 hours. When the distillate of water decreased, reaction temperature was raised to 200 degrees C, and the distillate of water was continued. The 10 ppm considerable amount of tetrabutyl titanate was added in the place where the acid number of reaction mixture became 5-10, the internal temperature was made into 210 degrees C, and the reaction was continued further. The reaction was ended in the place where the 6 hours after acid number became 0.5 or less, and the polyester polyol solution was obtained. As for this solution, the acid number was [0.2 and the hydroxyl value of 56.4 and viscosity] 11,900cp / 25 degrees C, and APHA was 10. Moreover, the number average molecular weight of polyester polyol was 2000.

[0028] (The synthetic example 2: Composition of polyurethane resin A) Isophorone diisocyanate 222g was taught to the flask of 2l. of inner capacity which attached a stirrer, a thermometer, and nitrogen gas installation tubing, and when the internal temperature was made into 60 degrees C, 1,000g of polyester polyol solutions obtained in the synthetic example 1 was dropped over 30 minutes. Finished dropping, kept reaction temperature at 100 degrees C, it was made to react for 4 hours, and the urethane prepolymer of 3.2% of isolation isocyanate ** was obtained. Methyl-ethyl-ketone 815g was added and agitated to this, and it considered as the homogeneity solution ("A' liquid" is called below). Subsequently, isophorone diamine 78.2g, 1.16g of G n butylamine, a 1221.5 g methyl ethyl ketone, and 1,024.4 g isopropyl alcohol were taken and agitated in the 5l. flask, and it was made homogeneity. After making the internal temperature of reaction mixture into the range of room temperature -40 degree C and dropping the whole quantity of A' liquid over 30 minutes, the internal temperature was

made into 50 degrees C, and it was made to react for 3 hours. Mn according [the obtained polyurethane resin solution ("A liquid" is called hereafter)] to 30% of resin solid content, viscosity 2,440cp / 25 degrees C, and GPC was [1.98 and Mw of 56,880 and Mw/Mn] 112,780.

[0029] (Example 1) As textile fabrics, the total fineness of 500 deniers, 96 filaments, and polyester fiber with a reinforcement of 9.0g [/denier] were used, and warp and the woof used 39 plain weave fabrics/inch. The plain weave fabric infiltrated the thiourea compound with the conventional method, and carried out fireproofing. It heated and dried and the lamination cloth was obtained, after applying to one side of textile fabrics the solution of polyurethane resin A obtained in the synthetic example 2 so that the amount of paint films at the time of desiccation may become 50 g/m². The lamination cloth was cut out, and as the lamination section became inside, it created the air bag.

[0030] (Example 2) The uniform and transparent constituent (nonvolatile matter 30wt%) which mixed polyurethane resin A200g and chlorination polypropylene ("super kuron 813A" chlorine content 30wt% and nonvolatile matter 30wt%) 100g [the solution of polyurethane resin A obtained in the synthetic example 2] obtained in the synthetic example 2 instead of, and was obtained in the example 1 was used, and also it carried out like the example 1. [by Nippon Paper Industries Co., Ltd.]

[0031] (Example 3) As textile fabrics, 6 and 6 nylon fiber with the total fineness of 840 deniers, 162 filaments, and a reinforcement of 9.5g [/denier] were used, and warp and the woof used 25 plain weave fabrics/inch. It heated and dried and the lamination cloth was obtained, after infiltrating into textile fabrics the solution of polyurethane resin A obtained in the synthetic example 2 so that the amount of paint films at the time of desiccation may become 40 g/m². The lamination cloth was cut out and the air bag was created.

[0032] (Example 4) The total concentration of 420 deniers, 72 filaments, and nylon 6 fiber with a reinforcement of 9.1g [/denier] were used, and warp and the woof used 45 plain weave fabrics/inch. The thiourea 5 weight section was mixed to the solution 100 weight section of polyurethane resin A obtained in the synthetic example 2, it heated and dried and the lamination cloth was obtained, after applying to both sides of textile fabrics so that the amount of paint films at the time of desiccation may become 55 g/m² in total. The lamination cloth was cut out, and as the lamination section became inside, it created the air bag.

[0033] Since each air bag obtained in above-mentioned each example has a good adhesive property with textile fabrics, it is lightweight, reinforcement is excellent, it is fire retardancy and a plasticizer is not further included in a coating layer, even if it is contained at the elevated temperature for a long period of time, there is no adhesion between textile fabrics, expansion of an air bag was smoothly performed also at the time of inflator actuation, a pinhole could not get bored easily due to the piece of the minute metal from an inflator, and air shutoff nature was below 2 ml/cm²/min.

[0034]

[Effect of the Invention] According to this invention, it excels in the expansibility of an air bag, an adhesive property with textile fabrics, weatherability, and pinhole-proof nature, and the thickness by the additive which comes up and is not ** is thin, it is lightweight, and the air bag of high intensity is obtained easily.

[Translation done.]

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(54) 【発明の名称】 ラミネート布及びエアバッグ

(57) 【要約】

【課題】 樹脂と織布との接着性は良好で、添加剤による織布間の付着のない、耐候性に優れ、製造方法の簡単なラミネート布、その製造方法及びエアバッグを提供すること。

【解決手段】 トリメチルー 1, 6-ヘキサンジオール類と脂肪族ジカルボン酸のエステル単位を 50 重量%以上含有し、数平均分子量が 500~5,000 のポリエステルポリオール及びジイソシアネート化合物からなるポリウレタン樹脂を、合成樹脂製フィラメント織物の少なくとも片面にラミネートしてラミネート布を得る。

ングリコール、ジカルボン酸やアミン類などを共重合したポリアミド、パラフェニレンテレフタルアミドおよび芳香族エーテルとの共重合などに代表されるアラミド、パラフェニレンサルフォン、ポリサルフォンなどのサルフォン系樹脂、ポリエーテルケトン樹脂等の合成繊維、炭素繊維、ガラス繊維等の連続モノフィラメント又はマルチフィラメント糸を使用することができる。

【0010】上記フィラメント糸としては、従来使用されている太さが400～1000デニールのものが使用される。フィラメント糸から織布を得るための織り方は平織り、綾織り等である。織布としては、生地目付が50～250g/m²、強度150～1000kg/3cm幅等のものが好ましい。

【0011】上記織布はポリウレタン樹脂によりコーティングされるので、フィラメント糸自体には、製造工程や加工工程で各種添加剤を含んでいてもよい。たとえば、熱安定剤、酸化防止剤、光安定剤、平滑剤、帯電防止剤、可塑剤、増粘剤、顔料、難燃剤などを含有させることができる。難燃剤等は織布に後から含浸させることもできる。

【0012】次に、上記織布にコーティングするポリウレタン樹脂について説明する。本発明に使用するポリウレタン樹脂は、高分子ポリエステルポリオールとジイソシアネート化合物を反応させて得られるポリウレタン樹脂を含有する。上記高分子ポリエステルポリオールは、少なくとも、3, 3, 5-トリメチル-1, 6-ヘキサンジオール及び/又は3, 5, 5-トリメチル-1, 6-ヘキサンジオール（以下、これらをトリメチル-1, 6-ヘキサンジオール（TMHD）類という）と脂肪族ジカルボン酸からなり、TMHD類と脂肪族ジカルボン酸とのエステル単位を全体の50重量%以上含有し、末端がアルコール性水酸基のものである。したがって、本発明で使用される高分子ポリエステルポリオールとしては、（1）脂肪族ジカルボン酸及びTMHDのポリエステルポリオール、（2）脂肪族ジカルボン酸及びTMHDとその他のポリオールの混合物のポリエステルポリオール、（3）脂肪族ジカルボン酸及びその他のポリオールのポリエステルポリオール、もしくは、他のポリエステルポリオールと、上記（1）又は（2）のポリエステルポリオールの混合物が挙げられる。

【0013】上記ポリエステルポリオールとしては、数平均分子量（本発明では特に断らない限り分子量は数平均で示す）が500～5000の高分子ポリエステルポリオールが好ましい。分子量が500未満であれば希釈剤に対する溶解性が低下するため、塗布性が劣り、5000を超える場合には乾燥性及び耐ブロッキング性の点で不十分となる。

【0014】上記その他のポリオールとしては、（1）酸化エチレン、酸化プロピレン、テトラヒドロフラン等の重合体または共重合体からなるポリエーテルポリオー

ル類、（2）グリセリン、トリメチロールプロパン、トリメチロールエタン、1, 2, 6-ヘキサントリオール、1, 2, 4-ブタントリオール、ペンタエリスリトール、ソルビトール、エチレングリコール、1, 3-プロパンジオール、1, 3-ブタンジオール、1, 4-ブタンジオール、ネオペンチルグリコール、ペンタンジオール、ヘキサジオール、オクタンジオール、1, 4-ブチンジオール、ジエチレングリコール、トリエチレングリコール、ジプロピレングリコール等の飽和および不飽和の低分子グリコール類が挙げられ、上記他のポリエステルポリオールとしては、（3）環状エステル化合物を開環重合して得られるポリエステルポリオール類、

（4）ポリカーボネートポリオール類、（5）ポリブタジエングリコール類、ビスフェノールAに酸化エチレンもしくは酸化プロピレンを付加して得られたグリコール類が挙げられる。

【0015】脂肪族ジカルボン酸としては、アジピン酸、無水フタル酸、イソフタル酸、テレフタル酸、マレイン酸、フマル酸、コハク酸、シュウ酸、コロン酸、グルタル酸、ピメリン酸、スベリン酸、アゼライン酸、セバシン酸等の二塩基酸もしくはこれらに対応する酸無水物あるいは酸塩化物が挙げられる。

【0016】本発明のポリウレタン樹脂は、高分子ポリエステルポリオールの他に、低分子ポリオールを構成成分として含有してもよい。低分子ポリオールとしては、ポリトリメチルヘキサンジオールの脂肪族二塩基酸エステル、特にアジペート、又は高分子ポリオール製造に用い得る前記各種の低分子ポリオールを例示できる。低分子ポリオールの使用量は、高分子ポリオールの10重量%以下であることが好ましい。使用割合が10重量%を超えると、得られるコーティング塗料の織布に対する密着性や希釈剤に対する溶解性が低下するからである。

【0017】本発明におけるジイソシアネート化合物とは、芳香族、脂肪族および脂環族のジイソシアネート類をいう。具体的には、1, 5-ナフタレンジイソシアネート、4, 4'-ジフェニルメタンジイソシアネート、4, 4'-ジフェニルメタンジイソシアネート、4, 4'-ジベンジルイソシアネート、ジアルキルジフェニルメタンイソシアネート、テトラアルキルジフェニルメタンジイソシアネート、1, 3-フェニレンジイソシアネート、1, 4-フェニレンジイソシアネート、トリレンジイソシアネート、ブタン-1, 4-ジイソシアネート、ヘキサメチレンジイソシアネート、2, 2, 4-トリメチルヘキサメチレンジイソシアネート、2, 4, 4-トリメチルヘキサメチレンジイソシアネート、トリレンジイソシアネート、シクロヘキサン-1, 4-ジイソシアネート、キシリレンジイソシアネート、イソホロンジイソシアネート、ジシクロヘキシルメタン-4, 4'-ジイソシアネート、1, 3-ビス（イソシアネートメチル）シクロヘキサン、メチルシクロヘキサレンジイソシ

アネート等を例示できる。織布の外面をラミネートするには、耐候性等の見地から脂肪族、脂環族のようなイソシアネート基が脂肪族炭化水素に結合したジイソシアネート類が好ましい。

【0018】本発明においてはポリウレタン樹脂に鎖伸長剤を使用することもできる。鎖伸長剤としてはエチレンジアミン、プロピレンジアミン、ヘキサメチレンジアミン、ジエチレントリアミン、トリエチレンテトラミン、イソホロンジアミン、ジシクロヘキシルメタン-4, 4'-ジアミンを例示することができる。また分子内に水酸基を有するジアミン類、例えば2-ヒドロキシエチルエチレンジアミン、2-ヒドロキシエチルプロピレンジアミン、ジ-2-ヒドロキシエチルエチレンジアミン、ジ-2-ヒドロキシエチルプロピレンジアミン、2-ヒドロキシプロピルエチレンジアミン、ジ-2-ヒドロキシプロピルエチレンジアミン等も同様に使用できる。

【0019】本発明におけるポリウレタン樹脂が、鎖伸長剤、重合停止剤または安定剤等としてアミノ基含有化合物を使用した場合には、得られたポリウレタン樹脂のアミン価が0~10 (KOHmg/g)の範囲であることが好ましい。アミン価がこの範囲にあれば、含まれるアミノ基および前記トリメチル-1, 6-ヘキサジオールのソフトセグメントの効果により、織布に対して優れた接着ラミネート適性を有するからである。

【0020】本発明で使用するポリウレタン樹脂は、数平均分子量(Mn)が5,000~100,000の範囲内であることが好ましい。数平均分子量が5,000未満の場合には、コーティング塗料の乾燥性、耐ブロッキング性、被膜強度が劣り、一方100,000を超える場合には粘度が高くなりすぎて塗布性が悪くなる。

【0021】本発明においては、ポリウレタン樹脂に難燃剤を添加することができる。難燃剤としてはチオ尿素系化合物、ハロゲン系有機化合物、特に塩素化ポリオレフィン、燐系有機化合物、無機系難燃剤等を添加することができる。塩素化ポリオレフィンとしては、たとえば、エチレン単独重合体、プロピレン単独重合体、もしくはこれ等モノマーと他のオレフィン系モノマーとの共重合体を塩素化したものであり、塩素含有率は1~60重量%、特に10~40重量%が好ましい。また、該塩素化オレフィンの数平均分子量は5,000~200,000、特に10,000~100,000が適している。立体規則的は問わない。塩素化ポリオレフィンの添加量は、ポリウレタン樹脂(1)/塩素化ポリオレフィン(2)=5/95~95/5(重量%)であることが好ましく、またこの範囲であればポリウレタン樹脂

(1)と塩素化ポリオレフィン(2)との配合比は任意に設定することができる。ポリウレタン樹脂と塩素化ポリオレフィンとは、本来相溶性が悪いが、本発明で使用する上記組成物は、特定の高分子ポリオールからなるポ

リウレタン樹脂を使用するため、均一で透明な溶液となる特徴がある。

【0022】上述のウレタン樹脂を塗布、積層によりラミネートする方法としては、上記ウレタン樹脂の溶液を塗布し乾燥してコーティングする方法、ウレタン樹脂フィルム of 圧着又は加熱によりコーティングする方法、押し出しラミネート法などの通常のコーティング法、さらに必要であれば接着剤、ホットメルト接着剤を用いたドライラミネート法を用いることができる。

【0023】ポリウレタン樹脂を溶液にして塗布する場合、溶解のための溶剤としては、通常、ベンゼン、トルエン、キシレン等の芳香族系溶剤、酢酸エチル、酢酸ブチル等のエステル系溶剤：メタノール、エタノール、イソプロピルアルコール、n-ブタノール等のアルコール系溶剤：アセトン、メチルエチルケトン、メチルイソブチルケトン等のケトン系溶剤を単独または混合して使用できる。

【0024】ポリウレタン樹脂のフィルムは、ポリウレタン溶液から得ることもできるが、ポリエステルポリオールとイソシアネートの反応により得られたポリウレタン樹脂自体を加熱溶融して押し出し法によりフィルムにすることができる。

【0025】ラミネート層の厚みは、1~100μm、好ましくは5~30μmであり、コーティング量は10~200g/m²、好ましくは20~100g/m²である。ラミネート層はエアバッグを構成する織布の全面にコーティングされていてもよいし、エアバッグ全面から見た平均的通気度が2ml/cm²/minであれば部分的にコーティングされていてもよい。ウレタン樹脂をラミネートすることにより、織布の強度にウレタン樹脂の引張、引裂強度が加わるので、エアバッグの機械的強度が向上する。

【0026】

【実施例】以下、実施例により本発明を具体的に説明するが、本発明はこれらに限定されるものではない。なお「%」は、特に示す場合を除くほか「重量%」を示し、「比率」は「重量比率」を示す。

【0027】(合成例1：ポリエステルポリオールの合成) コンデンサー、脱水管、攪拌器、温度計および窒素ガス導入管を取り付けた3リットルのフラスコに、3, 3, 5-トリメチルヘキサジオールおよび3, 5, 5-トリメチルヘキサジオール(比率1:2.7)を1, 578.2g、アジピン酸を1, 194.9g仕込み、加熱して反応させた。内温が160℃付近から水が留出し始め、約4時間かけて180℃まで反応温度を上昇させた。水の留出が減少した時点で反応温度を200℃に上げ、水の留出を続けた。反応液の酸価が5~10になったところでテトラブチルチタネートの10ppm相当量を加え、内温を210℃にして反応をさらに続けた。6時間後酸価が0.5以下になったところで反応を

終了し、ポリエステルポリオール溶液を得た。この溶液は、酸価が0.2、水酸基価が56.4、粘度は11,900cp/25℃であり、APHAは10であった。また、ポリエステルポリオールの数平均分子量は2000であった。

【0028】(合成例2:ポリウレタン樹脂Aの合成) 攪拌器、温度計、窒素ガス導入管を取り付けた内容量2リットルのフラスコにイソホロンジイソシアネート22.2gを仕込み、内温を60℃にした時点で合成例1で得られたポリエステルポリオール溶液1,000gを30分かけて滴下した。滴下を終え反応温度を100℃に保ち、4時間反応させ、遊離イソシアネート価3.2%のウレタンプレポリマーが得られた。これにメチルエチルケトン81.5gを加え攪拌し均一溶液(以下「A'液」と称す。)とした。次いで5リットルのフラスコにイソホロンジアミン78.2g、ジ-n-ブチルアミン1.16g、メチルエチルケトン122.1.5g、イソプロピルアルコール1,024.4gをとり攪拌して均一にした。反応液の内温を室温~40℃の範囲にしてA'液の全量を30分かけて滴下したのち、内温を50℃にして3時間反応させた。得られたポリウレタン樹脂溶液(以下、「A液」と称す)は、樹脂固形分30%、粘度2,440cp/25℃、GPCによるMnは56,880、Mw/Mnは1.98、Mwは112,780であった。

【0029】(実施例1)織布として、トータル繊度500デニール、96フィラメント、強度9.0g/デニールのポリエステル繊維を使用し、経糸ならびに緯糸とも39本/inchの平織物を使用した。平織物は常法によりチオ尿素化合物を含浸させて難燃処理した。合成例2で得られたポリウレタン樹脂Aの溶液を、乾燥時の塗膜量が50g/m²になるように織布の片面に塗布した後、加熱、乾燥してラミネート布を得た。ラミネート布を裁断して、ラミネート部が内側になるようにしてエアバッグを作成した。

【0030】(実施例2)実施例1で、合成例2で得られたポリウレタン樹脂Aの溶液の代わりに、合成例2で

得たポリウレタン樹脂A200gと塩素化ポリプロピレン(日本製紙(株)製「スーパークロン813A」、塩素含有率30wt%、不揮発分30wt%)100gとを混合して得られた、均一で透明な組成物(不揮発分30wt%)を使用した他は実施例1と同様に行った。

【0031】(実施例3)織布として、トータル繊度840デニール、162フィラメント、強度9.5g/デニールの6,6ナイロン繊維を使用し、経糸ならびに緯糸とも25本/inchの平織物を使用した。合成例2で得られたポリウレタン樹脂Aの溶液を、乾燥時の塗膜量が40g/m²になるように織布に含浸させた後、加熱、乾燥してラミネート布を得た。ラミネート布を裁断してエアバッグを作成した。

【0032】(実施例4)トータル濃度420デニール、72フィラメント、強度9.1g/デニールのナイロン6繊維を使用し、経糸ならびに緯糸ともに45本/inchの平織物を使用した。合成例2で得られたポリウレタン樹脂Aの溶液100重量部に対してチオ尿素5重量部を混合して、乾燥時の塗膜量が合計で55g/m²になるように織布の両面に塗布した後、加熱、乾燥してラミネート布を得た。ラミネート布を裁断して、ラミネート部が内側になるようにしてエアバッグを作成した。

【0033】上記各実施例で得られたエアバッグは、いずれも織布との接着性がよく、軽量で、強度が優れ、難燃性で、さらにコーティング層に可塑剤を含まないので高温で、長期間収納されていても織布間の付着がなく、インフレーター作動時にもエアバッグの膨張がスムーズに行われ、インフレーターからの微小金属片によってもピンホールがあきにくく、空気遮断性が2ml/cm²/min以下であった。

【0034】

【発明の効果】本発明によれば、エアバッグの膨張性、織布との接着性、耐候性、耐ピンホール性に優れ、添加剤による浮き出しのない、層厚が薄く、軽量で、高強度のエアバッグが容易に得られる。

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